5 Contamination from Transuranic Elements

INTERDEPARTMENTAL CORRESPONDENCE

cy: JC Dikeman 1/10/77

TO: Listed Distribution

DATE: December 30, 1976
FROM DEPT: 922
CODE NO: GAT-922 76-184
REFERENCE:

DEPT:
LOCATION:

SUBJECT: CONTAMINATION FROM TRANSURANIC ELEMENTS

Traces of transuranic elements, such as plutonium and neptunium, are present in reactor-return materials processed in the X-705 Building, These elements recently have been detected in sludge from the X-701-B Holding Pond and in spent trapping materials stored in the X-744-G Warehouse. Because transuranics represent a health hazard, it is necessary to take appropriate steps to assure the safety of GAT personnel and the local environment.

Also, GAT analytical procedures for transuranics must be improved. The liquid effluents from X-701-B in the East Drainage Ditch have been monitored for transuranics since November 1976, but present GAT analytical procedures have a limit of detection that is equal, at best, to about 7 percent of the ERDA recommended. concentration guide (RCG) for neptunium-237. These detection limits should be lowered to below 1 percent of the RCG to increase the effectiveness' of the environmental monitoring program. The detection limits for airborne transuranics should be improved similarly.

To accomplish these purposes a committee is hereby formed comprising the following persons :

C. P. Blackledge, Chairman
R. I. Kaplan
C. F. Trivisonno
J. S. Murrell
W. E. Martin
J, C, Dikeman

This group is assigned the responsibility of studying all aspects of transuranic contamination problems. at GAT, including the following:

1. Developing more effective means of excluding transuranics from plant effluents and further assuring effectiveness of GAT health protection procedures;

2. Developing more sensitive analyses for transuranics ;

3. Developing a program for detecting transuranics in incoming materials and for isolating materials that are heavily contaminated;

4. Determining proper shipping and/or disposal procedures for transuranic wastes; and .

5. Forecasting the amount of transuranics GAT will receive in the future.

First priority will be placed upon further assuring that transuranics are kept separate from plant personnel and the local environment. Note that proper health physics and safety precautions should be the first consideration when planning the transport or treatment of transuranic wastes,

The committee will prepare reports periodically, with a first report to be issued by February 1. These reports should include evaluations of the problems and recommended actions to be taken within GAT to solve these problems. For the first report, emphasis should be placed upon the first two enumerated items, and both short-term and long-term solutions should be considered.

R. W. Brown, Manager
Technical Division

Original Signed By
C. A. MENTGES

C , A. Mentges , Manager
Production Division

WDN : lnr

Distribution:

G. D. Althouse
C. P. Blackledge
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V. S. Emler
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TO: Listed Distribution

DEPT:

LOCATION:

DATE: January 21, 1977

FROM DEPT: 923

CODE NO: GAT-923-77-13

REFERENCE: GAT-923-77-11
GAT-922-76-184

SUBJECT: TRANSURANIC ELEMENTS COMMITTEE

As indicated in letter GAT-922-76-184, trace quantities of transuranic elements have been detected in sludge from the X-701-B Holding Pond and in spent trapping materials stored in X-744-G. The analysis of material from magnesium fluoride traps which were used. in the X-705 Oxide Conversion Facility has indicated significant concentrations of transuranic elements (460,000 d/m/g) . Analyses of samples from other trapping materials have revealed-the presence of transuranic element contamination:

, X-705' Sodium Fluoride Trap - 760 d/m/g! of transuranics
X-710 Chemical Trap - 3450 d/m/g of transuranics

The presence of transuranic elements in materials which were considered to be relatively "clean" indicates that we must implement stringent material control measures to minimize the spread of transuranic contamination. The existence of transuranic elements on these trapping materials, discovered by random analysis , implies that the contaminated wastes from the processing of the NLO reactor tails materials in1976 may not have been adequately controlled and contained.;; Thus, we must take the measures necessary to quantitatively identify the presence of all transuranic elements on plant site.

Analysis of sediments collected from the east drainage ditchindidates the presence of transuranic elements in concentrations which are below the current limits of detection (~ 5d/m/g) .) However, transuranic elements have been detected in X-701-B sludge and in the soil surrounding the holding pond. Sludge dredged from the pond in 1974 contains about 50 d/m/g; sludge removed this year contains about 160 d/m/g.' Sludge currently in the holding pond contains about 11 d/m/g; adjacent soil" contains about 46 d/m/g.

Trace quantities of transuranic elements.are probably being released to Little Beaver Creek; we estimate that the concentrations in water arc below the current analytical detection limits, Since neptunium and plutonium have been-detected in X-701-B, it' will be necessary to develop and implement a routine environmental monitoring program. Furthermore, we must take immediate action to prevent significant quantities of these radioisotopes from entering the environment from X-705.

Since transuranic elements are generally considered to bc both more toxicologically and radiologically hazardous than uranium, it is imperative that we establish health protection measures to ensure that our employees are not inadvertently exposed to, these materials until we can initiate adequate controls to assure their safety when handling *these* materials. We need to :

-identify the presence of transuranic elements (isotope , quantity, chemical form, and location) ;
-isolate transuranic elements from personnel and the environment ;
-develop interim handling procedures; and
-develop health protection, environmental: protection, and material control programs.

In order to properly' evaluate and control exposures of' 'employees and the environment, to transuranic elements, we must either develop new analytical procedures or improve existing techniques. The concentration Guides (CG's) in Table I, were derived for the most part from the yearly ERDA radiation exposure standards and are set forth in ERDAM 0524. The desired analytical detection limits have also been tabulated in Table I.

The Industrial Hygiene and Health Physics Department will prepare a tabulation of the minimum acceptable analytical limits of detection of specific transuranic elements in urine and air; Environmental Control will prepare a similar listing for water, soil, solid, vegetation, and air samples. After receiving these listings, the Chemical Analysis Laboratory should evaluate and quantify our capabilities in detecting trace quantities of transuranic elements. Interim analytical procedures should be developed and inplementcd until an acceptable laboratory facility can be developed. It is interesting to note that Paducah has budgeted for a new environmental lab in order to improve their capability of quantitatively detecting trace amounts of transuranic elements.

Our committee charter states that our first priority will be placed upon "further assuring that transuranics are kept separate from plant personnel and the local environment". Our second priority should address the problem of improving our analytical procedures. The following aspects of the transuranic contamination problem should be studied immediately:

1.	Identification of the presence of transuranic elements (isotope, quantity, chemical form, and location)	J.S. Murrell W.E. Mart in C.F. Trivisonno
2.	Isolation of transuranic elements from personnel and the environment.	C.P. Blackledge R.I. Kaplan
3.	Development of interim handling procedures,	J.C. Dikeman C.P. Blackledge R.I. Kaplan

January 21, 1977

4.	Evaluation and development of analytical procedures.	C.F. Trivisonno
5.	Acceptable minimum analytical detection limits.	W.E. Martin C.P. Blackledge

Additional Studies

6.	Development of transuranic material control program.	J.S. Murrell J.D. Dikeman
7.	Development of health protection program.	C.P. Blackledge
8.	Development of environmental control program.	W.E. Martin
9.	Development of shipping and/or disposal procedures.	R.I. Kaplan W.E. Martin
10.	Analysis of future transuranic contamination problems. Predict:.	J.S. Murrell R.I. Kaplan

a. Quantity received in future
b. Accumulation in cascade, traps,etc.

Draft reports including evaluations of items #1 - #5 and associated recommendations should be completed for review by the committee by February 7. These will be incorporated into the first committee report for February 14.

Charles P. Blackledge Jr

C.P. Blackledge,Jr.
Committee Chairman

CPB:mm

Listed Distribution

J.C. Dikeman
R. I. Kaplan
W.E. Martin
J.S. Murrell
C. F. Trivisonno

TABLE I

RADIATION CONCENTRATION GUIDES

Isotope	Solubility	Concentration Guide (Air)* (μCi/ml)	Desired Detection Limit (Air)	Concentration Guide (Water) (μCi/ml)	Desired Detection Limit (Water) (μCi/ml)
Amercium-241	S	6×10^{-12}		4×10^{-6}	4×10^{-8}
	I	1×10^{-10}		3×10^{-5}	3×10^{-7}
Neptunium-237	S	4×10^{-12}		3×10^{-6}	3×10^{-8}
	I	1×10^{-10}		3×10^{-5}	3×10^{-7}
Plutonium-238	S	2×10^{-12}		5×10^{-6}	5×10^{-8}
	I	3×10^{-11}		3×10^{-5}	3×10^{-7}
Plutonium-239	S	2×10^{-12}		5×10^{-6}	5×10^{-8}
	I	4×10^{-11}		3×10^{-5}	3×10^{-7}
Plutonium-240	S	2×10^{-12}		5×10^{-6}	5×10^{-8}
	I	4×10^{-11}		3×10^{-5}	3×10^{-7}
Plutonium-241	S	9×10^{-11}		2×10^{-4}	2×10^{-6}
	I	4×10^{-8}		1×10^{-3}	1×10^{-5}

*Controlled Area
+Uncontrolled Area

TABLE II

ANALYTICAL LIMITS OF DETECTION

Facility	Isotope	Medium	Detection Limit
Paducah	Kp-237	Liquid	1µg/l
	Pu-239	Liquid	0.01 µg/l
Mound	Pu-238,239	Water	0.01×10^{-10} µCi/ml
Argonne	Pu-238,239	Water	2×10^{-12} µCi/ml
Hanford	Pu-238,239	Water	0.003 pCi/ml
Argonne	Np-237	Water	3×10^{-6} µCi/ml
LASL	Pu-238,239	Water	0.1×10^{-9} µCi/ml
Pantex	Pu-239	Water	2×10^{-11} µCi/ml
Pineilas	Pu-239	Water	4×10^{-12} µCi/ml
LASL	Pu-239	Solid	1×10^{-4} pCi/g
Pantex	Pu-239	Solid	2×10^{-5} pCi/g
Pinellas	Pu-239	Solid	0.8×10^{-9} µCi/g
Hanford	Pu-239	Solid	0.001 pCi/g
Savannah River	Pu-239	Solid	2×10^{-10} µCi/g
Argonne	Pu-239	Solid	5×10^{-7} pCi/g
GAT	Pu-239	Solid	2×10^{-1} pCi/g

INTERDEPARTMENTAL CORRESPONDENCE

TO: V. J. DeVito, Superintendent
Nuclear Materials Control
DEPT: 930
LOCATION: X-100 Building

DATE: December 30, 1976
FROM DEPT: 922
CODE NO: CAT-922-76-185
REFERENCE:

SUBJECT: TRANSURANIUM ANALYSES OF BURIAL WASTES

Recent laboratory analyses of various materials have shown that substantial amounts of transuranic radionuclides exist on plantsite. Because the permissible environmental concentrations for many of these nuclides, as given in ERDAM 0524, are very stringent, every effort must be made to prevent or minimize their release to the environment. Thus, it is imperative that waste materials be analyzed for transuranics on a routine basis before these materials are disposed of in the environment. Therefore, it is requested that discardable scrap materials be routinely analyzed for transuranic nuclides in addition to the usual uranium and beta-gamma (technetium) analyses before burial or discharge in liquid effluents.

Original Signed By
V. S. EMLER

V. S. Emler, Superintendent
General Safety & Environment Mgt.

WEM:lnr

cc: R. W. Brown
✓J. G. Crawford
J. C. Dikeman
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C. R. Walker

INTERDEPARTMENTAL CORRESPONDENCE

EP/RAP

TO: J. G. Crawford, Superintendent
Uranium Operations
DEPT: 820
LOCATION: X-100 Building

DATE: December 28, 1976
FROM DEPT: 920
CODE NO: GAT-920-76-76
REFERENCE:

SUBJECT: TRANSURANICS IN SOLUTION RECOVERY MATERIALS

Relatively high concentrations of transuranic radionuclides recently were found in trapping materials stored in X-7446. One magnesium fluoride trap contained 190,000 d/m/g of neptunium-237 and 269,000 d/m/g of plutonium isotopes. Because of the grave dangers inherent in transuranics, both to human health and the environment, we request that all materials recovered from X-705 Oxide Conversion operations be sampled for transuranics before being processed for uranium recovery.

Our request applies to all materials recovered from oxide conversion, regardless of when they were generated. Preliminary data suggest that certain materials were contaminated with transuranics over a decade ago.

An interdivisional committee is being formed to solve the problems associated with the transuranics, and the committee will be given the task of deciding the ultimate fate of materials containing substantial amounts of neptunium or plutonium. Until that decision is made, we request that no material be run through solution recovery if analysis of the solid material shows the presence of transuranics.

V. S. Emler, Superintendent
General Safety & Environment Mgt.

WDN:lnr

cc: G. D. Althouse
R. W. Brown
V. J. DeVito
C. A. Mentges
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